Citrus Industry

F. M. O'BYRNE
President Florida State Horticultural Society

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ol. 27, No. 5 May, 1946

Food...

Is The World's Great Need Today!

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Help You Produce as Never Before

Europe and Asia are starving... even in America we are being urged to conserve food. You, the grower, are playing a mighty role in helping to feed a hungry world... but the cry for more and more food increases daily.

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JACKSONVILLE - FLORIDA

Spessard L. Holland

Florida's Wartime Governor

Deserves Your Vote And Support
In His Candidacy For The Office Of

United States Senator

Experienced Legislator . . . Citrus Grower . . . World War I Veteran Friend of Florida's schools . . . Holland's Integrity, Ability, Courage and Sound Common Sense Have Been Proved In Public Office and In His Private Life.

Spessard L. Holland

Is Needed In The Senate During The Critical Years Ahead In Which The Foundation Must Be Laid For A Lasting Peace.

He Needs Your Vote in the Democratic Primary

MAY 7TH

The Crying Need Of The World Today Is

FOOD and MORE FOOD

To meet the crisis, shall we not marshal the full productive capacity of our State and Nation? The task is a challenge to every grower and producer as well as to those of us who supply the FEEDS and FERTILIZERS. Is it not our common task to call forth the vast latent resources of Florida?

The X-Cel Program is planned to give to the grower every advantage modern research has to offer. At this time progressive pasturage improvement is of tremendous importance in the development of Florida's great meat producing industry. BASIC SLAG can be of outstanding assistance. It supplies essential plant food frequently deficient in Florida soils, and it improves the yield and nutritive qualities of pasture grasses. The result is BETTER FED CATTLE and MORE POUNDS of quality beef.

BASIC SLAG is also an excellent soil supplement for citrus groves and most Florida truck crops. Let us help you make every Florida acre yield its best. Write or phone for information and competent field service.

TENNESSEE BASIC SLAG
X-CEL FERTILIZERS
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Jackson Grain Company

Faithfully Serving Florida Agriculture for Thirty-Seven Years

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The Citrus Industry
EXCLUSIVE SPECIALIZED CITRUS PUBLICATION
Issued Monthly
Representative of every interest
Representing no special interest

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The Importance Of Microbial Action In Soils

F. B. SMITH
Head Department of Soils, College of Agriculture, at Meeting of Florida State Horticultural Society

It is impossible to over estimate the importance of microbiological action in soils, yet, because of their obscurity, the soil microraganisms have received but scant attention. The diffculty of growing plants in a sterile system and the fact that barren soils are usually sterile suggests a fundamental relation between soil microbes and plant growth.

The very close relationship between microbiological action in soils and the crop producing power of the soil is emphasized when one attempts to define soil fertility. Some of the more important processes in which it is known that soil microbes take an active part are:

1. Soil formation.
2. Decomposition of organic matter and humus formation.
3. Liberation of carbon, nitrogen, sulfur and phosphorus, and their transformations.
4. The formation of ammonia and nitrates.
5. The fixation of nitrogen.
6. Biological interactions, including the assimilation of nutrients, syntheas, oxidation and reduction, and associative and symbiotic relationships.

There are many factors involved in the formation of the soil body, but none is more important than the action of microorganisms. The acids produced by the microbes react with the rocks and primary minerals, changing them into the secondary minerals, the chemically active portion of mineral soils. They breathe the breath of life into this inert, dead body and make it alive, dynamic and subject to growth. Any study of this body necessarily requires a comprehensive knowledge of the microbes which inhabit it and so completely dominate its bio-chemical properties.

The decomposition of organic matter is probably the most important function of soil microorganisms. Life on earth would soon be impossible because of the accumulated plant and animal remains if the microbes were not continually acting upon them, reducing them to their elemental composition and to simple compounds available for use again. Carbon, nitrogen, sulfur and phosphorus, important elements in the growth of plants and to the life of animals and man, occur to a limited extent in the soil. The constant circulation of these elements in nature is brought about chiefly by the soil microbes. Large quantities of carbon dioxide are evolved as a result of organic matter decomposition. This is the source of carbon for all green plants. Also carbon dioxide dissolved in the soil solution acts on the insoluble minerals, making them available for plant use.

Decomposition of organic matter releases the mineral constituents in an available form and thereby completes the cycle of placing these elements in circulatioon again. The decomposition of proteins and other nitrogenous substances results in the liberation of ammonia which may be used directly by higher plants or oxidized to nitrites and nitrates by further microbial action. The liberation of sulfur and the action of the sulfur bacteria are equally as important as the transformations of nitrogen because sulfur exists in the soil chiefly in organic matter.

The air consists of about 80 per cent by volume of free nitrogen. It has been estimated that there are about 150,000 tons of this uncombined nitrogen over every acre of land, yet our crop plants are unable to make use of it because they can assimilate only combined forms. Nitrogen is not very active and it does not combine readily with other elements, except under extreme con-

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This Fertile Land . . . Of Ours

Excerpts from the address of Clifton A. Woodrum, President of the American Plant Food Council, Inc., before the Florida Horticultural Society at Miami, Florida, May 2, 1946.

Mr. Chairman and Gentlemen of the Society. It is an honor and a privilege to be permitted to appear before you briefly on this interesting program and to bring a few observations from a splendid group of American citizens, in an industry sense, whose business pursuits bring them closely in touch with the horticulturists as well as the American farmer .

"This Fertile Land Of Ours"

In this fertile land of ours there are about two-billion acres of the earth's surface.

A little more than half is devoted to farms. The remainder is in public and private forest and grazing lands; parks and other reservations; desert, swamps and rocky dunes, or in cities and towns.

But of the billion-odd acres in farms, only about one-third is harvested for crops. And from this fertile acreage comes our tremendous productive capacity.

Pasturage, both plowable and nonplowable, accounts for about 270,000,000 acres of land on farms and more than 400,000,000 acres—much of it mountainous—and has no agricultural value.

Farm Lands

In this land of ours there are 336 millions of acres of arable land, which provides each one of our 132 millions of people with over 2.5 acres of land for growing food and fibre.

When we compare our land resources with those of the western European countries we can better appreciate how fortunate we are. Great Britain has only .26 acres per capita. Holland .30 acres and Denmark and France each have 1.7 acres of arable land per person. These countries have of necessity been forced to intensive cultivation.

The genius of American agriculture has expressed itself in increased production per man rather than production per acre. In our national development we were short of manpower, but had plenty of land.

It is fortunate, indeed, that our American farmer did learn to produce more per man, for this achievement has been responsible for our great industrial and commercial development.

While agrirculture is still our basic and greatest industry, less than 25 percent of our population is engaged in farming. A hundred and fifty years ago 90 per cent of our people were required for this purpose.

By constantly increasing production per man, more and more of our agricultural population has been released to engage in industry, commerce and all of the other activities which have made us the most powerful nation in the world.

Whenever the need does arise for more intensive cultivation and increased production per acre, it can be done, and many of our good farmers are now producing high yields per acre.

We know how to produce more for our scientists, and good farmers have accumulated, through research and experience, a vast store of information on this broad subject.

Moreover, we are fortunate in having almost unlimited supplies of plant food for replenishing our soils and maintaining their fertility.

What this wonderful land of ours is capable of producing in food and fibre, no one knows. But no one can doubt, with our knowledge, skill and plant food resources our ability to support a much greater population when the need arises.

America's Responsibility

America owes her position of world leadership to her soil. The power, wealth and vigor of our people are directly due to the marvelous productivity of our land.

We fought and won two great wars within twenty-five years, and were able to feed and help many other peoples of the world, while doing so, because our farmers and farms could and did produce the necessary food.

With intelligent management and handling our land can go on producing indefinitely and in ever increasing quantities.

There are areas of land in this country which have been cultivated continuously for 250 years which are still as good as ever.

Depleted soils can be restored by intelligent management and we have the plant food resources for doing so.

The Challenge to America

As a member of the House of Representatives during that fateful period just preceding Pearl Harbor, I was constantly in touch with the great effort being made by our military leaders to prepare America for the inevitable war. It was necessary to quickly mobilize American industry. We had not only to recruit and train an army and a navy to provide them with the implements of war, but we had to be, in fact, "an arsenal of democracy." How well America answered this call is now a matter of history in which we take great pride. There was something else, however, that had to be done. Our own armies had to be fed and that was not all. We had to virtually become "the bread basket" for the world. Handicapped with severe shortages of labor, equipment and supplies, our American farmers amazed the world by their ability to produce food during the war years, for each year the previous years' records were exceeded. This great achievement of our farmers was the vital factor in winning the war and the intelligent use and application of fertilizer was of great assistance. In 1944 the War Food Administration made this statement: "The use of fertilizer will account for a minimum of 20 to 25 per cent of total food production in 1944."

Today there is another challenge to the farmers of America. We are told, and we know it to be a fact, that we cannot possibly hope to take our place of leadership in the

struggle for permanent and lasting peace if we ignore the plight of the famine stricken peoples of the earth. We can hardly expect to make an impressive argument for democracy to starving people. So once again the bugle calls the food producers of America to battle We must conserve the food that we have and we must raise more food. Knowing America as I do, I am firmly convinced that we will meet this challenge.

American Plant Food Council

I would like to tell you now, briefly a little something about the American Plant Food Council. It is a trade association representing an important segment of the fertilizer industry. It has been organized for the purpose and is dedicated to the task of serving American Agriculture.

Our Farmers

Our first and greatest obligation is to the farmers and to see that they obtain ample supplies of proper analysis fertilizers approved and recommended by state agricultural colleges and experiment stations. We will explore all new developments and disseminate information concerning them as soon as approved by the proper authorities.

Our Research and Educational Institutions

In recognition of the great work that has been and is being done by our soil scientists and teachers in our government, state colleges and schools and other institutions in increasing knowledge of land management we shall cooperate with them to the fullest extent, in the dissemination of all proven developments and assist wherever possible in research projects involving the use of plant food.

Our Land

Next in importance is to the land itself; to see that our soils obtain proper treatment; that soil fertility is maintained and improved in every possible way through good land management and the use of fertilizer; and that our natural plant food mineral resources are properly conserved and utilized.

Our Fertilizer Industry

Our final obligation is to the fertilizer industry in promoting the best practices in all branches from manufacturing through distribution to consumers and to create accurate understanding of the service rendered by this industry and its place and importance in our national life.

The Fertilizer Industry

In 1939 there were 764 plants for the production of mixed fertilizer and superphosphate. These plants employed more than 24,000 people, who were paid $23,400,000 in wages and salaries that year. Products sold were valued at $185,700,000.

In addition more than 50,000 agents and dealers throughout the country who comprise an effective and widespread educational force

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★★★★★

NACO BRAND

There IS enough....

NACO urges all growers to use only enough fertilizer to meet the actual needs of their trees and crops.

It isn't so much the matter of a shortage of total plant food, as it is the tremendous increase in the usage of fertilizer, here in Florida and throughout the United States, that has given rise to the thought that there is a greater shortage of fertilizer than actually exists. Because of this, some growers are often tempted to purchase more fertilizer than is absolutely needed.

Citrus growers who include the minor elements* in their mixture can use less pounds per tree than they could of fertilizer not containing these vital elements.

Truck growers can help us and themselves by planning to take some of their requirements this summer, thus allowing us to make a more orderly delivery throughout the season, and assuring themselves a supply on hand when most needed to start their crops.

NACO 5 STAR BRANDS CONTAIN
A Balanced Ration Of These Elements
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Copper PLUS Borax

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Soil Moisture Factors of Importance In Avocado Grove Management

J. R. FURR
Bureau of Plant Industry Soils and Agricultural Engineering, United States Department of Agriculture, Orlando, at Meeting of Florida Horticultural Society

In soils of low soluble salt content three factors largely determine the amount of "available moisture" that may be held for an extended period in the soil occupied by the root system of an orchard tree: (1) the field capacity of the soil, (2) the wilting range of the soil, and (3) the volume of soil permeated by the root system. During extended periods without rain or applications of irrigation water, trees on deep, well-drained soils are entirely dependent upon this so-called "available moisture", which is the water held by the soil at moisture contents between field capacity and the permanent wilting of the soil.

Field Capacity

The "field capacity" is the moisture, expressed as the percentage dry weight of the soil, retained by the soil after rapid drainage has ceased. Field capacity is determined primarily by the texture; that is, by the size of the particles in the soil. In general, the higher the proportion of clay and finely divided organic matter in the soil, the higher is the field capacity. Field capacity is not, however, a soil constant, but is affected by variations in texture structure, and density of the various layers in the soil profile. It also varies slightly with the temperature of the soil water and is higher in winter than in summer. In addition to these factors, the great variability of soil over large areas and the sampling errors resulting from the absorption of water by plants during the drainage period, make field capacity determinations in grove soils at best only approximate values.

It is generally assumed that, in sandy soils that are free of dense layers of clay or hardpan, rapid drainage after thorough wetting will be completed in 2 to 4 days and that the moisture content of samples taken at the end of this period represents the approximate field capacity. A more reliable estimation of field capacity may be made from drainage curves which are plotted from data obtained by sampling at intervals for several days after the soil was thoroughly wetted.

Drainage curves for the top 4 feet of an Orlando fine sand are shown in figure 1. Each value plotted represents the average of samples from 9 stations spaced 3 feet apart. This soil was free of plants, and the surface was covered to prevent evaporation. It is evident that in this soil drainage was slow, probably because of a layer of slightly cemented sand in the fourth foot. Even on the 4th day, the rate of water loss by drainage from this soil was greater than the probable rate of extraction by mature citrus trees. Loss by drainage from the 4 foot profile in acre inches per acre, calculated from the moisture percentages, was: 1st day, 2.118; 2nd day, 0.62; 3rd day, 0.19; 4th day 0.31. Since an extraction rate of only 0.05 to 0.13 acre inches per day by mature, vigorous trees is to be expected, it is clear that in this soil what might be termed "rapid" drainage had not ceased by the 4th day after wetting.

In addition to the uncertainty as to the proper interval to allow for drainage before sampling for field capacity determinations, it is frequently inconvenient to obtain samples at some definite time after the soil has been wetted. A satisfactory method of estimating field capacity from samples taken without regard to moisture conditions is needed. A simple and convenient laboratory method which shows promise of usefullness has been devised, but its reliability has not been thoroughly tested.

This method consists essentially in placing the samples in small metal cylinders on undisturbed soil, wetting samples and soil, allowing two or three days for drainage, and determining the moisture content of the samples at the end of the drainage period. The samples and soil were protected from large temperature changes and from loss by evaporation. In a comparison of field capacity values obtained by the laboratory method and by field sampling excellent agreement was obtained with the top foot samples; but possibly because of incomplete drainage in the field, the field values for the lower depths were appreciably higher than the laboratory values.

The Wilting Point of the Soil

The first permanent wilting point of a soil moisture percentage at which the leaves of plants growing in that soil just fail to recover from wilt in air that is nearly saturated by water vapor. If they recover turgor they were only temporarily wilted. At the first permanent wilting point plants make little or no growth even in very humid air.

The leaves of plants, such as the sunflower, which is usually used in wilting point determinations, do not wilt together; but as the soil dries out, the leaves wilt progressively from base to apex of the stem. At the first permanent wilting point of the soil, only the basal pair of (sunflower) leaves remain wilted in humid air. If placed in the open, the plant will continue to absorb water from the soil as successive leaves up the stem wilt, until finally the small apical leaves are wilted. The moisture content of the soil at which all leaves are completely wilted and fail to recover in nearly saturated air is called the "ultimate wilting point." When this stage is reached the plant soon dies.

The range in soil moisture percentage from the first permanent wilting point to the ultimate wilting point is called the wilting range. In many soils 20 or 25 percent of the total available moisture may be held in the wilting range. In light sands, however, this range is narrow, and in calculating the available moisture capacity of such soils, disregarding the water held at moisture contents below the first permanent wilting point will result in little error.

Under field conditions the entire soil mass occupied by the root system of a tree does not dry down to the "wilting point" (first permanent wilting point) at the same

time. In general, the root concentration is highest in the upper foot or two of soil and within the spread of the branches, and decreases with soil depth and to some extent with distance from the trunk. This distribution of roots results in unevendistribution and depth of root system, air temperature and humidity. It probably varies also with planting distance and possibly to some extent with soil texture. The moisture content of that portion of the soil that is still above the wilting point is almost certainly of importance. For example, if a few inches of soil in the root zone were wetted to field capacity by a rain, the rate of absorption in the wetted zone would almost certainly be higher than in a comparable layer of soil that was just above the wilting point. This has been demonstrated by wetting the soil in a small area under a wilted tree, and determining the rate of extraction from the wetted soil.

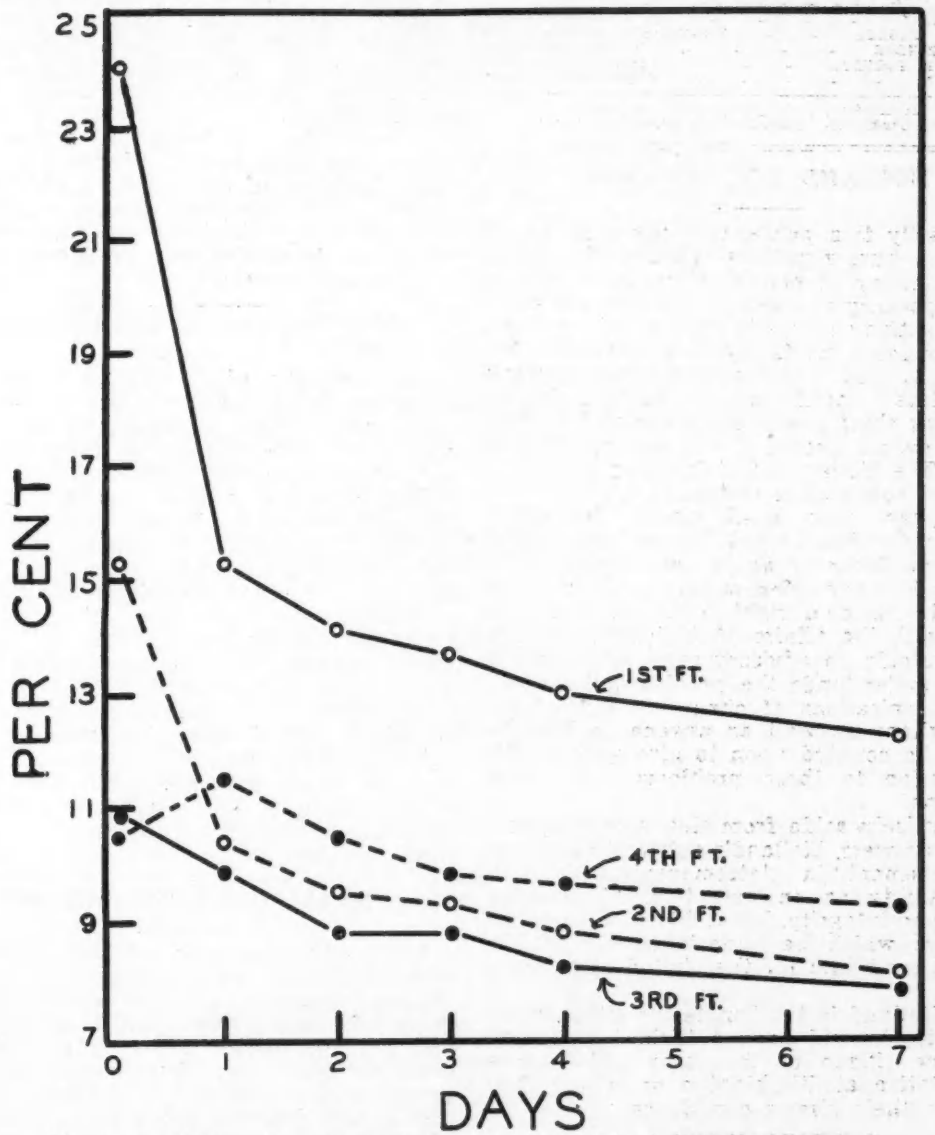

Figure 1. — The moisture content of the top four feet of an Orlando fine sand in relation to time after wetting. Sampled after wetting at intervals of: 1 hour; 1, 2, 3, 4, and 7 days.

drying of the soil. As the soil dries out during a prolonged drought, the soil in the zones of highest root concentration reaches the wilting point first, followed successively by soil in zones of lower and lower root concentration. Paradoxical though it may seem, the moisture content of an appreciable part of the soil has been reduced to the wilting point before the tree wilts, bud wilting is at first only temper-

Because of the great variability of soil and trees it is not possible to state, even in general terms, the depth to which the soil may be dried to the wilting point before wilting of citrus trees occurs. But trees with a healthy root system are not likely to wilt, even under rather severe weather conditions, until well over half of the small absorbing roots are in soil at mois-

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HOLLAND FOR SENATOR

Ordinarily this publication takes no active interest in purely political affairs. Six years ago this policy of non-interference in politics was temporarily abandoned and this magazine gave its active support to Spessard L. Holland in his campaign for Governor of Florida. We believed at that time that the citrus interests of the state would best be served by his election as chief executive of the state. Subsequent events proved the accuracy of that belief. The Holland administration proved to be one of outstanding statesmanship.

This year, with Ex-Governor Holland a candidate for the United States Senatorship, The Citrus Industry again feels impelled to give him its unqualified support. As a citrus grower in his own right, with intimate connection with the affairs of the citrus industry of the state in an advisory capacity, Spessard Holland understands the problems, the needs and the aspirations of citrus growers of the state perhaps as well as anyone in Florida. He may be counted upon to give sympathetic consideration to those problems, needs and aspirations.

But, entirely aside from this special appeal to citrus growers, Holland's outstanding record of achievement in statesmanship, his well known ability as an executive, his sterling honesty and integrity, his ability to accomplish the things which he undertakes makes him the ideal candidate for the United States Senatorship.

With Holland in the Senate the citrus growers of Florida will have a "friend at court" and every citizen of the state will have a representative at Washington on whom they can place their utmost confidence.

WOULD STRENGTHEN PLANT BOARD

Florida citrus growers are vitally interested in a proposal to strengthen the National Plant Quarantine Act through an amendment introduced in the United States Senate by Senator Elmer Thomas, chairman of the Committee on Agriculture.

The authority in this act at present is not sufficient to enable the Secretary of Agriculture to regulate the entry of foreign plants so as to reduce to a minimum the risk of entry of plant pests. This amendment proposed by Senator Thomas is designed to rectify this omission and thus to strengthen the hands of the Federal and State Plant Boards in applying quarantine measures.

The amendment is known as Senate Bill No. 1990. It has the endorsement of Federal and State Plant Commissioners and of Federal and State horticultural and agricultural bodies in general. It is of particular importance to the citrus growers of Florida by reason of our proximity to foreign lands and the great risk of importation of plant pests and diseases through our numerous ports of entry by both water and air.

It would be well for the citrus growers and other citrus interests of Florida to enlist the active support of our Senators and Representatives at Washington. Let them know how imperative it is that our interests should be protected from the risk of foreign invasion of destructive pests.

HORTICULTURAL SOCIETY MEETS

As this issue of The Citrus Industry goes to press, the Fifty-Ninth Annual Meeting of the Florida State Horticultural Society is in session at Miami, with what is reported to be a most gratifying attendance.

For well over a half century the Florida State Horticultural Society has been active in its efforts for the promotion of the citrus industry and other horticultural activities of the state. Each year subjects of vital interest to the industry have been discussed and at times the Society has taken an active part in the elimination of pests and diseases which have from to time threatened the industry. The program being carried out at the present session is one of especial interest.

Some of the papers presented at this session are being published in this issue. Others of especial importance to citrus growers will be found in succeeding issues of this publication.

SMALL GROWERS ORGANIZE

Under the leadership of Max Von Bargen of Lutz, a new citrus organization known as "Ethical Growers Inc.." is being formed. It is stated that the organization is designed to embrace the owners of small groves of 100 acres or less. Mr. Von Bargen states that groups will be formed throughout the state, that it will function primarily in the interest of the smaller grove owners and that no revolutionary or reactionary programs are contemplated. Charter of the organization was issued in 1943, but owing to war conditions no attempt was made to spread the organization until the cessation of hostilities.

At a meeting of the citrus advisory committee held recently at Winter Haven, several names were proposed for membership on the Florida Citrus Commission to succeed members whose terms expire in June. Governor Caldwell has indicated that he will follow the suggestions of his advisory committee in making the appointments.

SET THAT CROP

The only way to reap the full harvest from the substantial bloom now on your trees is to hold that crop on the trees . . . there are no dividends in young fruit which fall on the ground.

With the present crop prospects bright, your trees will need a liberal application of well-balanced fertilizer, supplied with ample amounts of essential secondaries.

Florida Favorite Fertilizer

will supply your every fertilizer need, as they are now doing for hundreds of successful growers throughout Central Florida's citrus belt.

Our customers will tell you also that when you buy from us your fertilizer is delivered to you by our own trucks, when needed.

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Many Improvements In Canning Of Citrus Juices And Other By-Products

The following notes on recent improvements in the canning of citrus juices and other citrus by-products are taken from the recently issued report of Orville E. May, Chief of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration for the year 1945. These findings will be of interest to all citrus growers and processors.

Canned Citrus Juices Improved In Flavor

Orange-juice concentrates of improved flavor were prepared at the United States Citrus Products Laboratory in Winter Haven, Fla., in cooperation with the Florida Citrus Commission, by evaporating juice under high vacuum to 65 degrees Brix and diluting with a quantity of fresh whole juice to a final concentration of 40-45 degrees Brix. Substantial amounts of volatile flavoring constituents are thus returned to the product, which can be diluted with water to produce a beverage like fresh orange juice. Storage tests are in progress on samples prepared by several variations of this new procedure, for which patent protection is being sought.

Publication of the previously reported work at the Winter Haven Laboratory on tangerine sirups and beverage-base concentrates resulted in much industrial interest, particularly among carbonated beverage manufacturers and samples of these products have been distributed to interested parties.

Preliminary experiments were conducted by the Agricultural Chemical Research Division in cooperation with the Eastern Regional Research Laboratory, to determine the applicability to citrus juices of the process developed at the Eastern Regional Laboratory for total flavor recovery from apple juice. The pilot-plant equipment used for apples was modified to separate the insluble volatile oil fraction continuously while the aqueous flavor essence was being recovered and concentrated. Bacteriological tests showed that the juice was pasteurized in the process of flash distillation of the flavor fractions under conditions that did not produce a cooked flavor in the residual juice. The residual juice was concentrated separately, and various combinations of the flavor essence, volatile oil, and juice concentrates were prepared for storage tests.

The United States Fruit and Vegetable Products Laboratory in Weslaco, Texas, made determinations of the taste appeal and keeping qualities of various blends of Hamlin and Temple orange juice, both alone and in combination with Marsh Seedless grapefruit juice. The most desirable flavor was obtained by combining 60 percent of grapefruit juice with 40 percent of a blend of two parts of Hamlin and one part of Temple orange juice. When sulfur dioxide was used as a preservative, it did not entirely prevent the loss of Vitamin C in storage.

Grapefruit Juice From Western Fruit Modified For Canning

The Fruit and Vegetable Chemistry Laboratory at Los Angeles has been investigating the possibility of achieving greater uniformity in the quality of canned juice made from California and Arizona grapefruit at different times during the season. Early fruit tends to be sour and bitter. As the season progresses the fruit becomes sweeter and less bitter, the best juice being obtained in mideason. During the latter part of the season the sugar content of the juice remains about the same, but the acidity decreases, making the juice somewhat insipid. Greater uniformity in the sugar-acid ratio of the juice would make it more acceptable to consumers.

Preliminary experiments on grapefruit juice made from selected lots of Arizona grapefruit picked at intervals during the season indicated that juice made early in the season could be improved by adding a buffer of salt to raise the pH from about 2.8 to about 3.3 and enough sugar to raise the Brix reading from 10.4 ot 12.5 degrees. The juice from midseason fruit was modified by adding smaller quantities of buffer salt to raise the pH to 3.2 or 3.3; addition of sugar was not necessary. Inspid juice obtained near the end of the season was modified by addition of citric acid or sodium citrate. The improvement in taste of the modified juices, as compared with that of unmodified control samples, was very striking. Thus far, no method has been devised for ridding the juice of the bitter substance nariben, which is extracted from the pith and rag of any grapefruit by the reaming process.

Citrus-Byproduct Waste Used As Raw Material In New Industries

The production of byproduct feed from citrus-juice cannings residues of pulp, peel and rag leaves unused large volumes of dilute carbo-hydrate-containing press liquor that constitutes a serious disposal problem. Evaporation of the liquor to a molasses is the basis of a process developed at the United States Citrus Products Laboratory in Winter Haven, Fla., for the fermentation of these carbohydrates to produce alcohol. During the 1944-45 season, alcohol was produced commercially from citrus molasses in a small plant at Lake Alfred, Fla., with technical cooperation and advice from members of the Bureau's personnel.

An alternative use for the dilute press liquor, developed at Winter Haven, is the production of feed yeast from the carbo-hydrate, mineral and protein nutrients in the liquor. A commercial firm began full-scale operation of this process during the present season and produced a torula yeast for incorporation with stock feed to increase its protein and vitamin content.

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We Are Making Progress

In the construction of our new Swift Plant Food Factory in Winter Haven and have every reason to believe that by early fall we will be in position, for the first time in many years to care for the requirements of additional customers.

With the present heavy bloom giving promise of a large crop it will be the policy of growers everywhere to exercise unusual care in providing their groves with ample fertilization. This fall when our new plant will enable us to offer more new customers the advantages of Swift's Program for Controlled Tree Feeding we know that the results will be mutually satisfying.

Our new insecticide plant is also in the process of construction and will be ready to supply citrus and truck growers with insecticides designed to care for their complete requirements.

SWIFT & COMPANY
PLANT FOOD DIVISION
BARTOW, FLA

Florida Sugar Harvest . . . Breaks Record

Current sugar harvest in the Florida Everglades has broken three all-time production records with the sugar cane grind at the three quarter mark exceeding that of the total harvest last year, Clarence R. Bitting, president of the United States Sugar Corp., reported recently.

The sugar house, largest in the nation, had ground 794,278 tons of sugar cane at the first of the month, as compared to 726,394 tons of cane ground during the entire 1944-45 harvest, which held the previous grinding record.

It also established a new record of 4,526 bags of sugar produced in one day, as compared with a previous high of 4,451, it ground 45,056 tons of cane in a single week against the former record of 44,019 tons; and set a new all-time monthly grind of 177,111 tons of cane as compared with the previous record of 174,271 tons.

"We hope to break other records before the season ends in May, including a new world's record for the amount of sugar cane ground by a single tandem mill and the number of bags of sugar produced," Bitting said. "If we are able to maintain present schedules we will grind more than one million tons of cane, and that will go a long way toward aiding American housewives to meet the sugar shortage."

Bitting credited the record breaking harvest, which is running ahead of schedule, to three factors: a large labor supply which enabled better cultivation of the present crop; favorable weather during the harvest season and "the outstanding teamwork which has been shown by workers throughout the entire organization."

To provide cane for the sugar house which is operating on a 24-hour schedule, more than 400 freight car loads of cane must move in daily from the company's twelve plantations extending some 50 miles through the Everglades. Approximately 30,000 acres are being cut and handled by thousands of workers in the harvesting, transportation and milling processes, as the largest producer on the continent keeps the stream of golden sugar moving to the housewives of the nation.

4-H CLUB WORK AGAIN IS ATTRACTING RURAL BOYS OF LAKE COUNTY

Tavares, Fla.—Lake County now has 13 very active boys' 4-H clubs, after the work was reorganized a few weeks ago, according to Jefferson P. Hill, assistant county agent.

The county has been without a 4-H club agent to assist County Agent R. E. Norris during the war years. Indicative of their revived interest, the boys plan to hold club meetings each month during the summer.

The Eustis Club is again operating a fine garden in the city. Umatilla Club is starting a citrus nursery, sponsored by the Lake County Express Shippers' Association. It will introduce new varieties of fruit into the county.

Mr. Hill says the county plans to send three boys and a local leader to 4-H Short Course at the University of Florida May 27-June 1.

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THIS FERTILE LAND OF OURS

(Continued from page 7)

and through specialized training are able to render valuable advice on fertilizing needs to their patrons.

Approximately one-third of fertilizer nitrogen is a by-product of the steel, coke and gas industries.

The production of synthetic nitrogen for fertilizer use is closely allied and integrated with the chemical industry which lowers the cost of production. Before the war about one-third of synthetic nitrogen production was used for fertilizer. Production capacity of nitrogen is now much greater than required.

There are 113 chemical plants in the U. S.—94 of which are by-products plants and 19 synthesize nitrogen compounds from the air.

The production of phosphate fertilzer is also closely allied to the chemical and sulfuric acid industry.

There were in 1939 thirty-three companies engaged in operating forty phosphate rock mines, who employed close to 4,000 people with a pay roll of $3,700,000 and whose products for the year were valued at $12,000,000.

The potash industry, comprising five large producers and several by-product companies in 1939 employed 1,600 people, paid in wages and salaries $3,650,000 and produced products valued at $14,000,000.

From 1939 to 1944, the American Potash Industry increased production 180 percent with a corresponding increase in wages and salaries. All of the capital required for this great expansion, which contributed vitally to the war effort, was provided by the potash industry itself.

From 1927 to 1940, the net average income was only .95 per cent or less than one cent out of each dollar of gross sales. This was based on all fertilizer companies who filed income tax returns with the U. S. Bureau of Internal Revenue. The highest return for any year was 5 per cent.

In 1941 the Federal Commission published a study of six fertilizer companies and found that for the year 1939 these companies made a combined net returrn on their total investment of 2.35 per cent.

Recognizing that farmers should use larger amounts of commercial plant food and believing that increased consumption will be further stimulated through research and educational activities, the industry is planning to expand their facilities just as rapidly as materials are available and restrictions are re-

BALANCE

Champion skiers leaving the take-off must possess perfect balance to make record jumps. And for record-breaking crop production, it is equally necessary to maintain a perfect balance in your soil.

Certain essential elements must be present in your soil, and always in the proper proportions, for maximum yields. Crop production, season after season, will upset the correct ratio of these plant foods in your soil, and only by applying the RIGHT fertilizer, in the right amount, at the right time, can this balance be restored.

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moved. Surveys indicate that 30 or more new fertilizer plants were either started during the war or projected for construction by private industry. Most of the new construction is scheduled for the Midwest and West coast areas.

A survey of the facts pertaining to the fertilizer situation shows, first, the increased amounts of high-analysis fertilizer supplied for agriculture without any appreciable plant expansion as follows:

Year 1920, tonnage used, 7296,000, average plant food content of all fertilizer 15.70 percent.

Year 1930, tonnage used 8,425,-000; average plant food content of all fertilizer, 18.08 percent.

Year 1940, tonnage used, 8,656,-000; average plant food content of all fertilizer 20.46 percent.

Year 1944, tonnage used 12,468,-000; average plant food content of all fertilizer, 20.64.

Second, the trend of fertilizer prices compared with other major commodities purchased by farmers as follows:

(1910-14 prices—100)

Seed, 1939 index 130; 1945 index 281.

Feed 1939 index 92; 1945 index 175.

Farm Machinery 1939 index 154; 1945 index 176.

Equipment and supplies 1939 index 110; 1945 index 141.

Building materials other than houses 1939 index 148; 1945 index 208.

Fertilizer 1939 index 100; 1945 index 121.

Average of all 1939 index 122; 1945 index 174.

The Challenge To The Industry

The American Plant Food Council is well aware of the challenge that faces the fertilizer industry today. Not only citizens of America but citizens of the world are fertilizer conscious. They are suddenly realizing that they can raise more crops, better crops and more nutritious food by intelligent land management and the proper application of plant food. We expect to meet this challenge and we feel that private enterprise should be quite able to do this job. In that we ask your cooperation and assistance. Give the fertilizer industry a chance to do its job and I am perfectly confident that it will respond in the way that other American industries have responded whenever they have had a challenge to meet.

THE IMPORTANCE OF MICRO-BAIL ACTION IN SOILS

(Continued from Page 5)

ditions of temperature and pressure. However, some of the soil microbes effect this reaction readily, leaving combined nitrogen for the use of the higher plants. The importance of this process is surpassed in nature possibly only by that of photosynthesis.

Ordinarily one thinks that maximum plant growth may be obtained when the soil is supplied with optimum moisture, adequate mineral nutrient elements, the temperature is favorable and insects and disease are absent or under control. This, however, is not the case. The soil may be supplied with all of these conditions and still be unproductive if the microbes are absent or conditions are not favorable for their growth. The point is made that the normal growth and development of the higher plants depend upon the soil microorganisms. Carreful observation of the roots of higher plants reveals unmistakeable evidence of the accuracy of this statement. Noteworthy examples of this very intimate interrelationship between the roots of higher plants and the soil microbes are found in the symbiotic relationship of the leguminosae and the root nodule bacteria, and the similar but less well understood mycorrhiza formations of soil fungi and forest trees.

Compounds produced by the microorganisms are assimilated by the higher plants. In the case of the leguminous plants fixed nitrogen is supplied by the bacteria, but the essential nature of the interaction

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So low is the Magnesia supply in many sections of the country that crops have only enough for the use of a few leaves on a plant at one time. Lower leaves show the first hunger signs, then the next set of leaves and so on up to the top of the plant. Magnesia is needed to increase yields and quality of crops even though there is no leaf discoloration.

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in the case of mycorrhiza fungi is less well understood. It is claimed that yeast requires for proper growth minute quantities of substances which are collectively known as "bios", the known constituents of which include inositol, vitamin B1, vitamin B6, pantothenic acid and biotin. Bacteria and molds synthesize biotin. It is thought that higher plants synthesize biotin. Do they, or do they obtain their supply from the soil microbes? There is no experimental evidence that they do not. If soil microorganisms were not so universally present on the roots of higher plants, the role of the microbes in plant growth would undoubtedly be better known.

It has been reported that plant hormones (biotin) extracted from decayed animal and plant tissues stimulated flower and seed formation. Gramicidin, actinomycin and penicillin are the names of antibiotic substances produced by soil microorganisms. What are the effects of these and other similar substances on the growth of the higher plants? The importance of pencillin for thereaputic use is well established but its effects on higher plants are unknown. The interrelationships between the soil microbes and higher plants is a field which remains wide open for investigation. When biological interactions are better known it is not improbable that new and improved soil management practices will be developed which will put the millions of microbes inhabiting the soil into more effective use for agriculture.

NEW GROWERS ORGANIZATION BEING FORMED

A new state-wide organization of commercial citrus growers is in the process of formation, with the first unit, now established at Lutz in Hillsborough county, as the nucelus, it was announced by Max Von Bargen of Lutz, president of Ethical Growers, Inc.

Mr. Von Bargen said that the organization was chartered in the spring of 1943, but because of war conditions it was decided to hold up the state-wide organization process until now. Local units of 10 or more growers, membership limited to owners of 101 acres or less, will be set up in counties or communities from time to time, Von Bargen said.

A statewide meeting of growers interested in the organization will be called within a short time, and a state headquarters, the location of which will be decided later, will be set up.

"We plan to bring into the organization, Ethical Growers, Inc., several thousand small growers over the state to band together for the mutual good—to cooperate with other organized factors in the industry, packers, shippers, canners and processors, to improve our situation and to assure distribution of the increeased production which is inevitable," the president said.

"The organization, formed by citrus growers with the interests of the industry at heart, will work with all other groups—we have no radical or reactionary ideas of reforming the growing and marketing of citrus fruits, just to improve our situation in every possible way," the president said.

Florida has had no simon-pure growers organization since the abandonment of "Florida Citrus Growers, Inc.," several years ago, Von Bargen pointed out, adding that "We will have huge problems in the future—problems that will take the utmost cooperation from every factor in this big business.

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Reports Of Our Field Men . . .

POLK COUNTY
J. M. (Jim) Sample

We are well along with our summer fertilizer application and this operation will be completed by the middle of June. Growers are using a well balanced mixture and of course this means that they include ample amounts of secondary elements. It is getting rather dry throughout the entire County and those growers equipped with irrigation facilities have their plants going full time. We have done a thorough job of spraying this spring and this will be followed through the season to keep a nice crop of fruit clean and of top quality for the market this fall. There are quite a few groves changing hands in the County and at very good prices. Fruit is rapidly being moved to market and the season will end quite a bit earlier than was at first anticipated. Prices being received for fruit at this time are very satisfactory.

WEST CENTRAL FLORIDA
E. A. (Mac) McCartney

Growers are now applying their summer application of fertilizer and giving the trees a full poundage of well balanced mixture with ample amounts of secondary plant foods. This is very important as we have a very nice crop of ruit being set on the trees and with a heavy crop more plant food will be required. Speaking of spreading fertilizer, those growers that are using the Lyonizer fertilizer distributor are well pleased with the results they are getting with the machine. Without exception these growers claim that the Lyonizer is one of the most satisfactory spreaders that they have ever used. Vegetable growers are getting excellent prices for their products and should have a very successful year. We are doing more spraying this spring than ever before, and we believe that this territory will have one of the best crops of fruit ever produced when it is placed on the market this fall.

NORTH CENTRAL FLORIDA
V. E. (Val) Bourland

Fruit buyers are finding it difficult to find sufficient fruit to keep their packing plants in operation, and prices being paid are very good. The fruit season will be over within the next few weeks and most growers will end with very successful operations. There is a heavy watermelon crop in this territory and while some fields are not up to standard, the total yield will be high. The first melons will start moving to market by the 10th of May. Other vegetable crops in the section are moving to market at very attractive prices and the yields are satisfactory. We are getting along with our fertilizer application and this will be completed by the first of July. Growers have been busy with their copper sprays and this will be followed with oil at the earliest possible date. A large acreage of new groves have been planted in the territory and more land is being cleared and will be planted this fall and in the Spring.

SOUTHWEST FLORIDA
Eaves Allison

Citrus trees have continued to bloom on through to the present time and much fruit has been set of several different sizes. The dry weather of the past several weeks has made it necessary to start up irrigation plants and where sufficient moisture has been maintained a heavy setting of fruit has resulted. On those groves lacking facilities for watering a considerable amount of late bloom fruit is beginning to drop. Melanose has been especially bad this spring and control measures have been necessary to a greater degree than normal on this account. Truck crops are below average somewhat due to early flooding rains and therefore the total yields are expected to be lighter than the acreage planted would indicate. Prices are high and this will do much to offset the effect of a lesser yield. Cucumber crops have suffered more than tomatoes from the seasonal conditions encountered this year. Growers in this section are getting under way with their summer application of fertilizer.

HILLSBOROUGH & PINELLAS COUNTIES
C. S. (Charlie) Little

We have started our summer application of fertilizer and this will be continued on into June. Without exception we are using well balanced mixtures containing adequate amounts of the necessary secondary elements. The fruit season will be over much earlier than most of us thought, and it is now very hard to find a crop of fruit that has not been sold. Prices have been very good and most growers in this territory will end the season in a very successful manner. For the first time in a number of years we have noticed quite a bit of scab this spring and in a few instances it has been very active. Most growers are about through with their copper spray and will follow with oil as soon as possible. We have a very nice crop of fruit in the territory and every indication is that we will have some real quality this coming season.

SOUTH POLK & HIGHLANDS COUNTIES
R. L. (Bob) Padgett

After having expeienced one of the best spring seasons in a number of years the dry weather is now beginning to take its toll. It is getting extremeny dry in this section and those groves not equipped with irrigation are beginning to lose some fruit. It seems that adequate irrigation facilities are just as essential as thorough spray program in the production of citrus fruits. We had quite a heavy infestation of red spider this spring and as a result every grower has been busy with his spray machine. At this time it is safe to say that the lower ridge section has an excellent opportunity to set a record as far as yield and quality is concerned on production of oranges and Marsh seedless grapefruit for the coming season. Common grapefruit is light. We are going along with our summer application of fertilizer, and will finish this operation by the first of July. Fruit prices are very good, but it is hard to find crops that have not been sold and some shippers are closing their packing houses.

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Beats all how sometimes it's easy to figger wrong . . . we can remember as far back as 20 years ago when everyone was sayin' that we had too many citrus trees and that if folks didn't stop plantin' 'm it wouldn't be but a little while 'til the price of citrus would be so low nobody could afford to grow it . . . but all durin' that 20 years new groves has been comin' into production, thousands of acres of other groves has been and are bein' planted, and yet today the prices growers are gettin' for their fruit remains with a satisfactory range . . . so it seems that guessing a couple of generations ahead of time is sort of a hazardous business.

'Course if the market had remained what it was a couple of generations back they wouldn't have been enuf folks to consume all the fruit we raise now . . . but thanks to natural progress and the aggressiveness of various growers, individually and in organizations, new markets has been developed and new methods of marketing fruit has developed, while the processin' of citrus today puts it in the hands of everybody, everywhere, and all over the world people are bein' told how helpful the use of citrus fruit is to health, and each year more millions are making citrus a part of their daily diet.

Time was when flowers was just sumpin you raised for pretty around the house . . . but today the raisin of flowers has become a big Florida industry, 'specially durin' the winter months . . . Glads are bein' raised all over the state furnishin' a lot of jobs to a lot of people, while the business of growin' Easter lilies is now an important factor . . . this spring they was acres and acres of lilies planted in Hardee and Highlands counties.

We've got one of the doggonest heaviest blooms on our trees right now we've had in a long time . . . and every grower knows that the way to make these blooms turn into good, sound fruit is to see that the trees get plenty to eat . . . a well balanced fertilizer mixture that has plenty of secondary elements will do the job, when used in connection with a spray program that'll keep insect pests under control . . . this sort of tree treatment right now will turn into dollars when harvest time comes.

Looks like they's always soumpin' to keep a grower guessin' . . . and the new blight that has developed in the vegetable section of the state has a lot of experts doin' some heavy studyin'.

The Lyonizer fertilizer distributor is doin' a swell job for a lot of growers all over the state . . . growers say it is the finest machine of the sort on the market, that it does a perfect job of distributin' the exact poundage desired and that it's economical to boot.

Uncle Bill

Howard Made Chief Agricultural And Industrial Chemical Bureau

Dr. O. E. May, Chief of the Bureau of Agricultural and Industrial Chemistry, who resigned will be succeeded by Dr. L. B. Howard, Assistant Chief of that Bureau, P. V. Cardon, Agricultural Research Administrator, has announced. Dr. May is leaving the Department of Agriculture to become associated with a large corporation in an executive capacity.

Dr. May rose from the ranks in the Department, where he has served for the last 23 years. He began as an assistant in a laboratory and was promoted successively until he became Chief of the Bureau. He was the first director of the Soybean Products Laboratory at Urbana, Ill., and the first director of the Northern Regional research Laboratory at Peoria, Ill., where present methods were developed for commercial production of penicillin. Prior to appointment as Chief of BAIC he was coordinator of chemical research for the Agricultural Research Administration.

Dr. Howard has been associated with the Bureau of Agricultural and Industrial Chemistry for 14 years. He was assistant to Dr. May at the Northern Regional Research Laboratory. Later he was head of the Commodity Byproducts Divisioon of the Western Regional Research Laboratory at Albany, Calif. He became Assistant Chief of the Bureau last November. He has had wide experience in searching, through chemistry, for outlets for the products and byproducts of the farm and is thoroughly familiar with that phase of the national farm program.

Dr. Howard was born at Bloomington, Ill., in 1905 and received his Bachelor's degree from Purdue University in 1927, his Master's degree from the University of Chicago the same year, and the Ph. D. degree from the University of Chicago in 1930. He is a member of the American Chemical Society and the Institute of Food Technologists.

SOIL MOISTURE FACTORS OF IMPORTANCE IN CITRUS AVOCADO GROVE MANAGEMENT

(Contiued from page 9)

ture contents in the wilting range.

Some writers have stated that if soil in a part of the root zone remains for a considerable period at the wilting point, the roots in this soil will be killed by desiccation. It is true that roots near the surface in soil that is dried below the wilting range by surface evaporation may be killed by desiccation. It is, however, very unlikely, that roots in soil in the wilting range are injured by drying so long as the tree as a whole receives adequate moisture from these roots that are in relatively moist soil. There is good evidence that water may move from a root in moist soil to any part of the tree where water shortage occurs. Thus water lost from roots in soil at moisture contents well below the first permanent wilting point may be replaced by movement from roots in soil at moisture contents above the wilting point. Under such conditions, roots will stay alive for months in soil in the wilting range and remain capable of active absorption soon after the soil is wetted. If during a drought, enough water is applied to soil in some of the root zone to prevent severe wilting of the tree, it is practically certain that nearly all of the roots in the non-wetted as well as the wetted soil will escape injury from desiccation at depths below the influence of surface evaporation.

Available Moisture Content of Avocado and Citrus Grove Soils

Table 1 gives the first permanent wilting point, the field capacity, and the available moisture capacity at various depths in the top six feet of soil in three avocado plots on a Norfolk fine sand. Field capacity values were obtained by the laboratory method.

The wilting point, the field capacity and the available moisture capacity values of the top six inches of this soil are roughly double the corresponding values for the lower depths. This difference is apparently caused by a relatively high content of organic matter in the top six inches.

The high organic matter content of the top six inches presumably resulted from the grower's practice, over a period of many years, of applying organic matter and growing cover crops. Doubtless this addi-

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SOIL MOISTURE FACTORS OF IMPORTANCE IN CITRUS

(Continued from page 20)

tional organic matter has been of great value in the nuntrition of the trees and has added slightly to the available moisture capacity. These data, however, indicate that it is not practicable to increase very greatly the total available water capacity of sandy soils over large areas, such as avocado or citrus groves, by the addition of organic matter. It is in periods of drought that an increase in the available moisture capacity would be of most value, but during such periods a large part of the water in the top three or four inches of soil is lost by surface evaporation before it can be absorbed by the roots. If we assume that the available moisture capacity of the top six inches was doubled, that is, raised from 0.15 to 0.30 acre inches per acre by the addition of organic matter, but that the top three inches of soil dried out by evaporation, the net increase of available moisture would be .07 acre inches per acre, probably not over two days' water supply for the mature avocado trees in this grove.

Table 1. First Permanent Wilting Point, Field Capacity and Available Moisture Capacity of a Norfolk Fine Sand Planted to Avocados.

The total available moisture capacity of the top six feet of soil in this grove was estimated to be nearly two acre-inches per acre. The samplings for moisture determination on the avocado plots were not timed in such a manner as to permit an accurate calculation of the moisture extraction rate, but an estimate made from the data available suggests that during the last half of March 1945 the extraction rate was about .07 acre inches per acre per day, or 2.1 inches per month. Under such conditions, starting with the soil at field capacity, the available moisture supply in the top six feet of this soil would be exhaused in about a month.

Table 1. First Permanent Wilting Point, Field Capacity and Available Moisture Capacity of a Norfolk Fine Sand Planted to Avocados.

Soil Depth (Feet)	First Permanent Wilting Point (Percent)	Field Capacity (Percent)	Available Moisture Capacity Per depth interval (Acre-inches per acre)	Available Moisture Capacity Per av. foot of depth interval (Acre-inches per acre)
		PLOT A		
0.0-0.5	2.6	6.9	0.31	0.62
0.5-2.0	1.2	3.1	.41	.27
2.0-4.0	1.0	3.3	.66	.33
4.0-6.0	1.1	2.7	.46	.23
0.0-6.0	—	—	1.84	.31
		PLOT B		
0.0-0.5	2.6	7.0	0.32	0.64
0.5-2.0	1.2	3.5	.50	.33
2.0-4.0	1.1	3.3	.63	.31
4.0-6.0	1.0	2.8	.52	.26
0.0-6.0	—	—	1.97	.33
		PLOT C		
0.0-0.5	1.8	5.2	0.24	0.48
0.5-2.0	1.2	3.5	.50	.33
2.0-4.0	1.0	3.2	.63	.31
4.0-6.0	1.1	3.2	.60	.30
0.0-6.0	—	—	1.97	.33

In Table 2, the wilting point, the field capacity, and the available moisture content of some citrus grove soils are given. Surface soils and sub-soils were taken in separate samples. The field capacity values given for these soils are simply the field moisture contents determined at the time of sampling and since the samples were taken in the summer, when almost daily rains occurred most of them are probably somewhat higher than the actual field capacity.

(To be continued next month)

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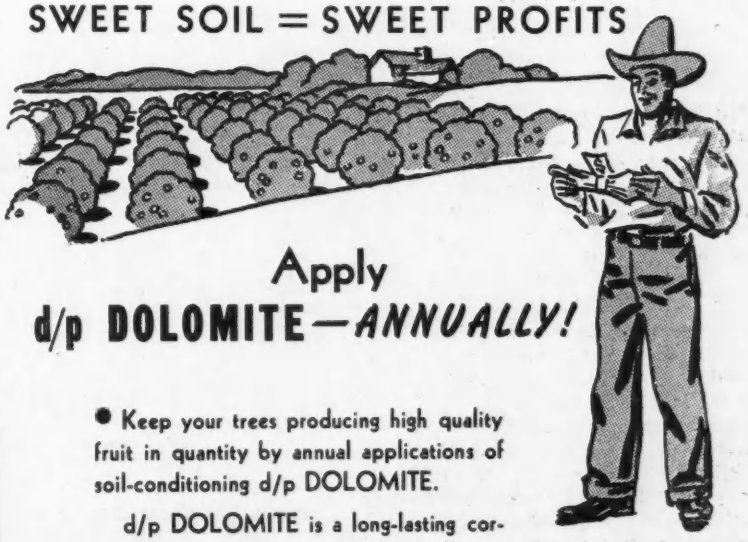

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